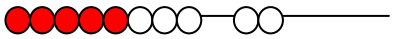
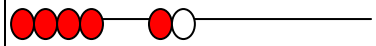
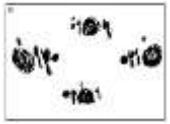
Calculation Policy

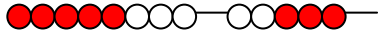
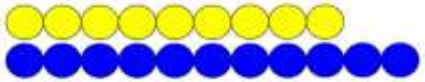
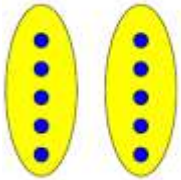
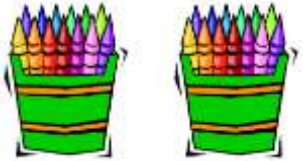
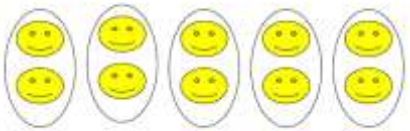
Malmesbury Primary School

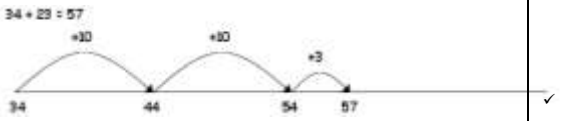
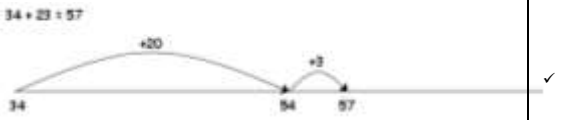
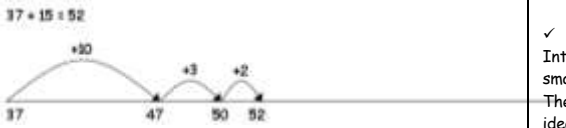
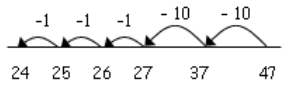
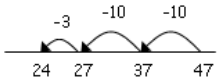
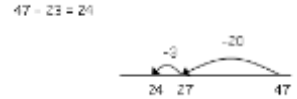
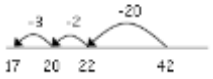
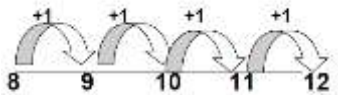
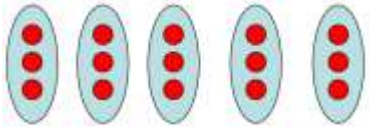
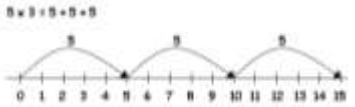
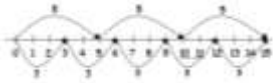
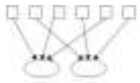
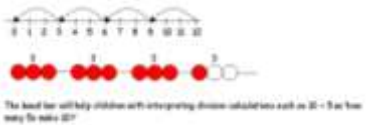
This calculation policy has been updated in line with the programmes of study taken from the National Curriculum for Mathematics (2014). It provides guidance on appropriate calculation methods and progression. The content is set out in yearly blocks under the following headings: addition, subtraction, multiplication and division.
Children will use mental methods as their first port of call, but for calculations that they cannot do in their heads, they will need to use an efficient written method accurately and with confidence.

AIMS OF THE POLICY
- *To ensure consistency and progression in our approach to calculation*
- *To ensure that children develop an efficient, reliable, formal written method of calculation for all operations*
- *To ensure that children can use these methods accurately with confidence and understanding*

HOW TO USE THIS POLICY
- *Use the policy as the basis of your planning but ensure you use previous or following years' guidance to allow for personalised learning*
- *Always use Assessment for Learning to identify suitable next steps in calculation for groups of children*
- *If, at any time, children are making significant errors, return to the previous stage in calculation*
- *Cross reference with the mental maths policy for guidance on key facts, key vocabulary and mental methods*
- *Always use suitable resources, models and images to support children's understanding of calculation and place value, as appropriate*
- *Encourage children to make sensible choices about the methods they use when solving problems*

	Addition	Subtraction	Multiplication	Division
EYFS	Children will engage in a wide variety of songs and rhymes, games and activities. They will begin to relate addition to combining two groups of objects, first by counting all and then by counting on from the largest number. They will find one more than a given number. In practical activities and through discussion they will begin to use the vocabulary involved in addition. They develop ways of recording calculations using pictures, etc.  Bead strings or bead bars can be used to illustrate addition  8+2=10 They use numberlines and practical resources to support calculation and teachers demonstrate the use of the numberline. 	Children will engage in a variety of counting songs and rhymes and practical activities. In practical activities and through discussion they will begin to use the vocabulary associated with subtraction. They will find one less than a given number. Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures etc.  . Bead strings or bead bars can be used to illustrate subtraction (including bridging through ten) by counting back.  **6-2=4** They use numberlines and practical resources to support calculation. Teachers demonstrate the use of the numberline. They will begin to relate subtraction to 'taking away' using objects to count 'how many are left' after some have been taken away. **6 – 2 = 4** 	Children will experience equal groups of objects. They will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups.  Children will engage in a wide variety of songs and rhymes, games and activities. In practical activities and through discussion they will begin to solve problems involving doubling.  'Three apples for you and three apples for me. How many apples altogether?'	Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s forwards and backwards.  Children will engage in a wide variety of songs and rhymes, games and activities. In practical activities and through discussion they will begin to solve problems involving halving and sharing.  Share the apples between two people. 'Half of the apples for you and half of the apples for me.'

	Addition	Subtraction	Multiplication	Division
Year 1	Initially use a number track to count on from the largest number:  **5 + 4 = 9** 'Put your finger on number five. Count on (count forwards) four.' Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.  Then progress to a marked number line: **6 + 6 = 12**  'Put your finger on number six and count on six.' Ensure children are confident with using a marked number line before moving on to an empty line. Children should know that 3 + 5 has the same answer as 5 + 3. This can also be shown on the number line.	Children will continue to practise counting back from a given number. Initially use a number track to count back for subtraction:  **9 – 5 = 4** 'Put your finger on number nine. Count back five.' Then progress to a **marked number line:** **12 - 6 = 6**  'Put your finger on number twelve and count back six.' Bead strings or bead bars can be used to illustrate subtraction including bridging through ten by counting back 3 then counting back 2.  **13-5=8** Children then begin to use numbered lines to support their own calculations - using a numbered line to count back in ones. **Counting on to find a small difference:** Introduce complementary addition to find differences (only use for small differences). The use of models is extremely important here to understand the idea of "difference". Count up from the smallest number to the largest to find the difference using resources, e.g. cubes, beads, number tracks/lines: 11 – 9 = 2 	Children will count repeated groups of the same size in practical contexts. They will use the vocabulary associated with multiplication in practical contexts. They will solve practical problems that involve combining groups of 2, 5 or 10. e.g. socks, fingers and cubes.  'Six pairs of socks. How many socks altogether? 2, 4, 6, 8, 10, 12' Use arrays to support early multiplication 'Five groups of two faces. How many faces altogether? 2, 4, 6, 8, 10' Two groups of five faces. How many faces altogether? 5, 10'   '2 groups of 5' 'How many altogether?' '5 + 5 = 10' Double five is ten	Children will start with practical sharing using a variety of resources. They will share objects into equal groups in a variety of situations. They will begin to use the vocabulary associated with division in practical contexts. 'Share these eight apples equally between two children. How many apples will each child have?'  Children will move from sharing to grouping in a practical way 'Put 20 crayons into groups of 10. How many pots do we need?'  Use arrays to support early division  'How many faces altogether? How many groups of two?'  'Five groups of two'

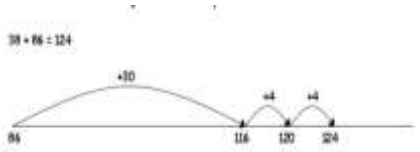
	Addition	Subtraction	Multiplication	Division
Year 2	Children will begin to use 'empty number lines' themselves starting with the larger number and counting on. Secure children's understanding of counting on in ones. Then children should be able to count on in tens (use in conjunction with a 100 square to show the jumps). Once children are confident, use an empty number line to add 2 two-digit numbers. ✓ First counting on in tens and ones.  ✓ Then helping children to become more efficient by adding the units in one jump (by using the known fact 4 + 3 = 7).  ✓ Followed by adding the tens in one jump and the units in one jump.  ✓ Bridging through ten can help children become more efficient.  If children are ready, use the partitioning method to add 2 two-digit numbers. 43 + 25 = 68 40 3 20 5 40 + 20 = 60 3 + 5 = 8 60 + 8 = 68	Children will begin to use empty number lines to support calculations. Secure children's understanding of counting back in ones. Then children should be able to count back in tens (use in conjunction with a 100 square to show the jumps). **Counting back:** ✓ First counting back in tens and ones. 47 – 23 = 24  ✓ Then helping children to become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4). 47 – 23 = 24  ✓ **Subtracting the tens in one jump and the units in one jump.**  ✓ **Bridging through ten can help children become more efficient.** 42 – 25 = 17  ✓ **Counting on to find a small difference:** Introduce complementary addition to find differences (only use for small differences). The use of models is extremely important here to understand the idea of "difference" (see Y1 guidance). Count up from the smallest number to the largest to find the difference. 12 - 8 = 4  'The difference between 8 and 12 is 4.'	Ensure that children are confident with the methods outlined in the previous year's guidance before moving on. Children will use a range of vocabulary to describe multiplication and use practical resources, pictures, diagrams and the x sign to record. Children will develop their understanding of multiplication and use jottings to support calculation: ✓ **Grouping**  '5 groups of 3' '5 lots of 3' '3 + 3 + 3 + 3 +3 = 15' '5 times 3' '3 multiplied by 5' '5 x 3 = 15' '3 x 5 = 15' ✓ **Repeated addition** 3 times 5 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x3 Repeated addition can be shown easily on a number line:  and on a bead bar:  ✓ **Commutativity** Children should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.  ✓ **Arrays** Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method. **6 x 5 = 30**  '5 + 5 + 5 + 5 + 5 + 5 = 30' '6 rows of 5' '6 groups of 5' '5 groups of 6' '5 x 6 = 30' '6 x 5 = 30'	Children will develop their understanding of division and use jottings to support calculation ✓ **Sharing equally** 6 sweets shared between 2 people, how many do they each get?  ✓ **Grouping** There are 6 sweets, how many people can have 2 sweets each?  ✓ **Repeated subtraction using a number line or bead bar** 12 ÷ 3 = 4  ✓ **Arrays** **15 ÷ 5 = 3** **15 ÷ 3= 5**  How many groups of 3? How many groups of 5? 15 shared between 3 people is...? 15 shared between 5 people is...? 15 divided by 5 = 3 15 divided by 3 = 5 ✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations** □ ÷ 2 = 4 20 ÷ △ = 4 □ ÷ △ = 4

Year 3

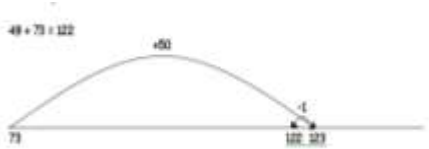
Addition

Children will continue to use empty number lines with increasingly large numbers, including compensation where appropriate.

✓ Count on from the largest number irrespective of the order of the calculation.



✓ **Compensation**



Introduce the expanded written method:

63 + 32 = 95

60 + 3
+ 30 + 2
90 + 5 = 95

'Partition the numbers into tens and ones/units. Add the tens together and then add the ones/units together. Recombine to give the answer.'

Then...

63
+ 32
5 (3 + 2)
+ 90 (60 + 30)
95

Add the least significant digits (units) together first and then the tens in preparation for the formal written method.

This will lead to the formal written method:

63
+ 32
95

Use the language of place value to ensure understanding: 'Three add two equals five. Write five in the units column. 60 add 30 equals 90. Write 9 (90) in the tens column.'

If children are ready, extend to the formal method where it is necessary to 'carry over':

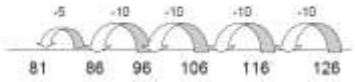
68
+ 24
92

Use the language of place value to ensure understanding: 'Eight add four equals 12. Write two in the units column and 'carry' one (10) across into the tens column: 60 add 20 and the ten that we 'carried' equals 90. Write 9 (90) in the tens column. 92 is the answer.'

Subtraction

✓ Children will continue to use empty number lines with increasingly large numbers.

126 – 45 = 81



Children will begin to use informal pencil and paper methods (jottings).

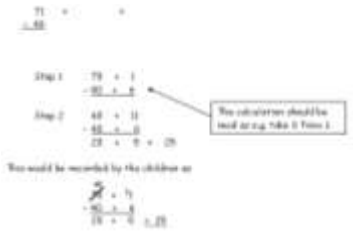
✓ **Partitioning and decomposition**

- Partitioning – demonstrated using arrow cards
- Decomposition - base 10 materials

NOTE When solving the calculation 89 – 57, children should know that 57 **does NOT EXIST AS AN AMOUNT** it is what you are subtracting from the other number. Therefore, when using base 10 materials, children would need to count out only the 89.

89 = 80 + 9
- 57 50 + 7
30 + 2 = 32

✓ **Begin to exchange.**



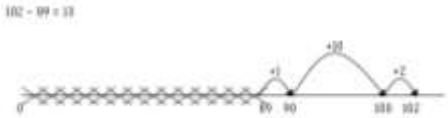
✓ When children are confident, extend to the formal method:

73 – 27 = 46

6 13
7 3
- 2 7
4 6

Use the language of place value to ensure understanding.
'We can't subtract seven from three, so we need to exchange a ten for ten ones to give us 60 + 13.'

✓ Where the numbers involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.



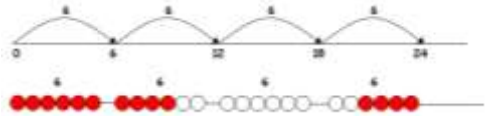
Multiplication

Children will continue to use:

✓ **Repeated addition**

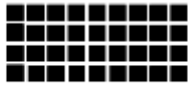
4 times 6 is 6 + 6 + 6 + 6 = 24 or 4 lots of 6 or 6 x 4

Children should use number lines or bead bars to support their understanding.



✓ **Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.



9 x 4 = 36

9 x 4 = 36

✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

□ x 5 = 20 3 x △ = 18 □ x O = 32

✓ **Partitioning**

38 x 5 = (30 x 5) + (8 x 5)
= 150 + 40
= 190

✓ **Grid Method (teen number multiplied by a one- digit number):**

13 x 8 = 104

X	10	3
8	80	24

80 + 24 = 104

✓ This will lead into expanded short multiplication:

13 x 8 = 104

13
x 8
24 (3 x 8)
+ 80 (10 x 8)
104

✓ Formal short multiplication:

1 3
X 8
1 0 4
2

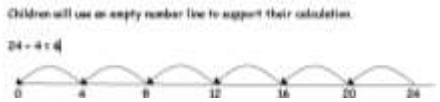
Ensure that the digit 'carried over' is written under the line in the correct column.

Use the language of place value to ensure understanding.

Division

Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.
Continue to use practical resources, pictures, diagrams, number lines, arrays and the ÷ sign to record, using multiples that they know, as appropriate (see Y2 guidance).
Children will continue to use:

✓ **Repeated subtraction using a number line**



Children should also move onto calculations involving remainders.

✓ Introduce the formal layout using multiplication/division facts that the children know:

24 ÷ 3 = 8

This can also be recorded as...

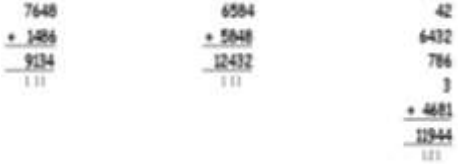
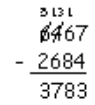
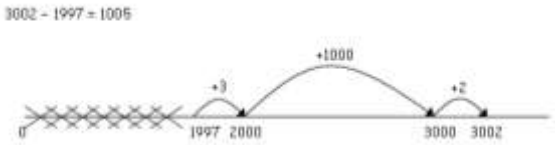
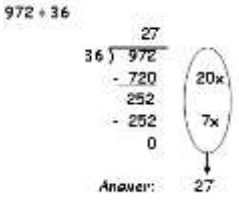
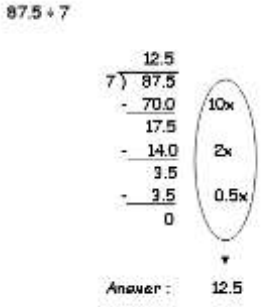
8
3) 24

✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

26 ÷ 2 = □ 24 ÷ △ = 12 □ ÷ 10 = 8

	Addition	Subtraction	Multiplication	Division
Year 4	**Continue to teach to use an empty number line with 3 and 4 digit numbers, if appropriate.** Further develop the formal written method of addition, with three-digit numbers. Revisit the expanded method first, if necessary: **176 + 147 = 323** 176 + 147 13 (7 + 6) 110 (70 + 40) 200 (100 + 100) 323 This will lead into the formal written method… **176 + 147 = 323** 147 + 176 323 11 Use the language of place value to ens understanding: 'Seven add six equals 13. Write three in the u column and 'carry' one across into the tens colu (10). 40 add 70 and the ten that we carried equ 120. Write 2 in the tens column (20) and 'carry' across into the hundreds column (100). 100 add and the 100 that has been carried equals 300. W 3 in the hundreds column (300). *Using similar methods, children will (if ready):* ✓ *add several numbers with different numbers of digits;* ✓ *add 4-digit numbers;* ✓ *begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds;* ✓ *know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £3.59 + 78p.*	**Ensure that children are confident with the methods outlined in the previous year's guidance before moving on.Continue to teach the use of empty number lines with three and four digit numbers, as appropriate.** **Continue to develop the formal written method of subtraction by revisiting the expanded method first, if necessary. Continue to use base -ten materials to support understanding.** ✓ **Partitioning and decomposition** 754 - 80 Step 1 700 + 50 + 4 - 80 + 6 Step 2 700 + 40 + 14 *(adjust from 1 to 0)* - 80 + 6 Step 3 600 + 140 + 14 *(adjust from 11 to 7)* - 80 + 6 600 + 60 + 8 = 668 This would be recorded by the children as 600 + 140 + 14 - 80 + 6 600 + 60 + 8 = 668 ✓ **Decomposition** 754 - 86 668 When children are confident, develop with four digit numbers and decimal numbers (in the context of money and measures). *Children should:* ✓ *be able to subtract numbers with different numbers of digits;* ✓ *using this method, children should also begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds;* ✓ *know that decimal points should line up under each other.*	Children will continue to use arrays where appropriate leading into the grid method of multiplication. x 10 4 6 60 24 (6 x 10) + (6 x 4) 60 + 24 84 Continue to practise the formal method of short multiplication of a two-digit number by a one -digit number throughout Y4 (see Y3 guidance). **If children are confident**, continue to develop short multiplication with three- digit numbers multiplied by a one-digit number. If necessary, return to the grid method and/or expanded method first: ✓ **Grid method** **127 x 6 = 762** | x | 100 | 20 | 7 | | 6 | 600 | 120 | 42 | 600 + 120 + 42 = 762 (add the partial products) ✓ **Expanded short multiplication** **127 x 6 = 762** 127 x 6 42 (6x7) + 120 (6x20) 600 (6x100) 762 ✓ **Formal short multiplication** 127 x 6 762 2 4 Use the language of place value to ensure understanding. Ensure that the digits 'carried over' are written under the line in the correct column.	Children will develop their use of repeated subtraction to be able to subtract multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s – numbers with which the children are more familiar. Then onto the vertical method: **Short division TU ÷ U** 72 ÷ 3 3) 72 - 30 (10x) 42 - 30 (10x) 12 - 6 (2x) 6 - 6 (2x) 0 Answer: 24 Leading to subtraction of other multiples. 96 ÷ 6 16 6) 96 - 60 (10x) 36 - 36 (6x) 0 Answer: 16 This will lead into the formal written method of short division: **98 ÷ 7 = 14** 14 7) 98 Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2. Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division.

	Addition	Subtraction	Multiplication	Division
Year 5	Continue to teach the use of empty number lines with larger numbers (and decimals), as appropriate. Continue to develop the formal written method for addition with larger numbers (and decimal numbers) and with the addition of three or more numbers: **21848 + 1523 = 23371** 21848 + 1523 23371 1 Use the formal written method for the addition of decimal numbers: Ensure that the decimal points line up. £154.75 + £233.82 = £388.57 154·75 + 233·82 388·57 1 Continue to use the language of place value to ensure understanding.	✓ **Partitioning and decomposition** Step 1 754 = 700 + 50 + 4 − 286 = − 200 + 80 + 6 Step 2 700 + 40 + 14 *(adjust from T to U)* − 200 + 80 + 6 Step 3 600 + 140 + 14 *(adjust from H to T)* − 200 + 80 + 6 400 + 60 + 8 = 468 This would be recorded by the children as − 200 + 80 + 6 400 + 60 + 8 = 468 ✓ **Decomposition** 754 − 286 468 ✓ **Including decimal numbers** **£166.25 – £83.72 = £82.53** 166·25 − 83·72 82·53 Ensure the decimal points line up. *Children should:* ✓ *be able to subtract numbers with different numbers of digits;* ✓ *begin to find the difference between two decimal fractions with up to three digits and the same number of decimal places;* *know that decimal points should line up under each other* Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used. 1209 − 388 = 821 +12 +800 +9 0 388 400 1200 1209	Build on the work covered in Y4 with the formal method of short multiplication (two-digit number multiplied by a one-digit number). When children are confident introduce multiplication by a two-digit number. If necessary, return to the grid method and/or expanded method first. ✓ **Grid method (two-digit number multiplied by a teen- number):** 23 x 13 = (20 + 3) x (10 + 3) = 299 | X | 20 | 3 | | --- | --- | --- | | 10 | 200 | 30 | | 3 | 60 | 9 | 230 + 69 299 **Expanded long multiplication** 23 x 13 = 299 23 X 13 9 (3 x 3) 60 (3 x 20) +30 (10 x 3) 200 (10 x 20) 299 **Compact long multiplication (formal method):** 23 x 13 = 299 23 X 13 +69 (3 x 23) 230 (10 x 23) 299 Use the language of place value to ensure understanding. Add the partial products. *Using similar methods, they will be able to multiply decimals with one decimal place by a single digit number, approximating first. They should know that the decimal points line up under each other.* e.g. 4.9 x 3 Children will approximate first 4.9 x 3 is approximately 5 x 3 = 15	Children will continue to use written methods to solve short division TU ÷ U. Children can start to subtract larger multiples of the divisor, e.g. multiple of 10 **Short division HTU ÷ U** 196 ÷ 6 32 r 4 6) 196 − 180 (30×) 16 − 12 (2×) 4 Answer: 32 remainder 4 or 32 r 4 Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2; or fractions ,i.e. 14 4/6 or 14 and 2/3 Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division. Continue to practise the formal written method of short division with whole number answers and with remainders: **184 ÷ 8 = 23** 23 8) 18 4 **432 ÷ 5 = 86 r2** 86 r 2 5) 43 2

	Addition	Subtraction	Multiplication	Division
Year 6	Children should extend the carrying method to number with any number of digits.  *Using similar methods, children will* ✓ *add several numbers with different numbers of digits;* ✓ *begin to add two or more decimal fractions with up to four digits and either one or two decimal places; know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 401.2 + 26.85 + 0.71.*	**Decomposition**  *Children should:* ✓ *be able to subtract numbers with different numbers of digits;* ✓ *be able to subtract two or more decimal fractions with up to three digits and either one or two decimal places;* ✓ *know that decimal points should line up under each other.* Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used. 	Ensure that children are confident with the methods outlined in the previous year's guidance before moving on. Continue to practise and develop the formal short multiplication method and formal long multiplication method with larger numbers and decimals throughout Y6. Return to an expanded forms of calculation initially, if necessary (see Y5 guidance). **The grid method (decimal number multiplied by a two-digit number):** **53·2 x 24 = 1276·8** x | 50 | 3 | 0·2 | 20 | 1000 | 60 | 4 | 1064·0 4 | 200 | 12 | 0·8 | 212·8 1276·8 **Formal method** 53·2 x 24·0 21 1 2·8 (53·2 x 4) 1064·0 (53·2 x 20) 1276·8 It is an option to include ·0 in this example, but not essential. The prompts (in brackets) can be omitted if children no longer need them.	Children will continue to use written methods to solve short division TU ÷ U and HTU ÷ U. **Long division HTU ÷ TU**  Any remainders should be shown as fractions, i.e. if the children were dividing 32 by 10, the answer should be shown as $3\ ^{2}/_{10}$ which could then be written as $3\ ^{1}/_{5}$ in its lowest terms; or as a decimal, i.e. 3.2 Extend to decimals with up to two decimal places. Children should know that decimal points line up under each other. 

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.
Children should not be made to go onto the next stage if:
they are not ready.
they are not confident.
Children should be encouraged to approximate their answers before calculating.
Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.